

# PATENT COOPERATION TREATY

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INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/US2005/003988

International filing date (day/month/year)  
04.02.2005

Priority date (day/month/year)  
04.02.2004

International Patent Classification (IPC) or both national classification and IPC  
G01R33/3415, G01R33/44

Applicant  
E.I. DUPONT DE NEMOURS AND COMPANY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITYInternational application No.  
PCT/US2005/003988

AP20 Rec'd PCT/PTO 28 JUL 2006

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Box No. I Basis of the opinion

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material:  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing:  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. II Priority

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1. ☒ The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43*bis*.1 and 64.1) is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

**WRITTEN OPINION OF THE  
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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	2-8, 11-15, 18-22
	No: Claims	1, 9, 10, 16, 17, 23
Inventive step (IS)	Yes: Claims	
	No: Claims	1-23
Industrial applicability (IA)	Yes: Claims	1-23
	No: Claims	

2. Citations and explanations

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

Re Item V.

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**1 The following documents are referred to in this written opinion:**

D1 = GB 2 289 344  
D2 = WO 99/45409  
D3 = EP 0 426 851  
D4 = US 6,150,816  
D5 = WO 03/096041  
D6 = WO 00/70356  
D7 = WO 98/54590

**2 Lack of novelty and/or an inventive step (Art. 33(2) and 33(3) PCT)****2.1 Independent claims 1, 10, 17**

- a) The subject-matter of **claim 10** would appear to lack novelty with respect to each of the documents D1-D5 for the following reasons.

For instance, document D1 discloses (references in parentheses referring to D1):

An NQR detection system for detecting NQR in an object (the rf coil assembly depicted in fig. 1) comprising:

- two or more sensors tuned to a specified NQR frequency (the individual rf coils 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b shown in fig. 1; see also p.14, l. 2-19), wherein each sensor receives the specified NQR signal (implicitly disclosed on p. 14, l. 2-5 by referring to "examination between two arrays of coils"; see also p. 1, l. 8-11);
- means to add coherently NQR signals detected by the sensors (the detecting and measuring circuit shown in fig. 4 which comprises elements 25 to 30; see p. 16, l. 4 to p. 18, l. 2; in particular, see p. 17, l. 27-28

referring to the cumulative adding of spin-echo responses and p. 18, l. 1-2 referring to stray phase shifts which are to be avoided).

Moreover, fig. 4 of D1 implies the presence of an electrical path from each sensor to a combination point at which the signals are added and that the signals received across the paths add constructively at the combination point (it is noted that the digital signal processor 30 in fig. 4 can be taken as the "combination point"; alternatively, the point where signals of the individual coils of a single coil pair are added can be taken as the "combination point", see p. 17, 1st par.). Therefore, the lack of novelty holds also for **claim 17**.

Furthermore, at least implicitly, D1 discloses also a method of detecting NQR that employs the detection system disclosed therein. Thus, the lack of novelty holds also for **claim 1**.

In a similar way, the lack of novelty can be shown with respect to each of the documents D2-D5 (see the passages of these documents cited in the search report; with respect to D3, it is noted that D3 explicitly refers to "a coil array as that disclosed in ... GB 2289344" (p. 24, 1st par.) which corresponds to document D1; thus, taking into account that D2 was available to the public on the publication date of D3, said documents can be considered to form one piece of prior art; see the Guidelines, C-IV 7.1; w.r.t. D4 and D5 it is noted that the addition of signals received from individual sensors (see e.g. D4, col. 12, l. 33-43) would appear to be done coherently, that is with a fixed phase relationship among the individual signals).

- b) Moreover, the subject-matter of claim 10 would appear to lack an inventive step with respect to each of the documents D6 and D7 for the following reasons.

For instance, the subject-matter of claim 10 differs from that of D6 only in that the sensors are tuned to a specified NQR frequency rather than to an NMR frequency as in D6 (see the passages cited in the search report). Moreover, this difference involves that each sensor receives the specified NQR signal rather than an NMR signal as in D6.

However, NQR and NMR represent neighbouring technical fields that are similar to a high extent and that are dealt with in the same textbooks. In particular, fictitious spin 1/2 operators can be used to provide a description of NQR in analogy to the operator formalism known in NMR.

Moreover, it is well-known in the art that the guiding principles of rf coil design are identical in NMR and NQR (documents will be cited, if necessary), the difference between NMR and NQR coils merely being the resonance frequency upon which the coils are tuned. However, tuning of an rf coil to the desired resonance frequency by manipulating its inductance and capacitance is well-known in the art. Moreover, in this context, it is noted that the NMR coil array disclosed in D6 is tuned to a frequency in the low MHz range (D6, page 3, l. 25) and that NQR involves transitions in the same frequency range.

Therefore, no inventive step would appear to be involved in tuning the coils of the array disclosed in D6 to an NQR frequency rather than an NMR frequency.

In a similar way, taking into account that NQR and EPR represent neighbouring technical fields as well, the lack of an inventive step can be shown with respect to D7 as well.

## 2.2 Dependent claims 2-9, 11-16, 18-23

The additional features of claims 2-9, 11-16 and 18-23 are either known from, or rendered obvious by the available prior art for the following reasons.

*Claims 2, 11, 18*

- a) See the passages of D6 cited in the search report.
- b) Moreover, the subject-matter of **claim 11** differs from that of D2 only in that each sensor is comprised of a high temperature superconductor (HTS) coil rather than a coil made from normally conducting material as in D2.

The technical effect of each sensor being a HTS coil is an increased sensitivity

of the sensor since resistive losses (that result in noise in the NQR signal) in superconductors are small compared to normally conducting materials.

Therefore, the problem to be solved is the one mentioned in D2 itself (page 23, l. 27), namely to increase the signal-to-noise ratio (SNR) of the coil array according to D2.

Given this problem, the skilled person would consider the possibility of using rf coils made from HTS material since this solution is already mentioned in D2 itself (page 23, l. 28-29). Thus, the skilled person would be tempted to replace the individual, normally conducting rf coils of the coil array of D2 by superconducting coils. Therefore, starting from D2, the skilled person would arrive at the subject-matter of claim 11 without the exercise of any inventive skill.

Moreover, D2 discloses a detection system according to claim 17 and a method according to claim 1 as well (see above). Therefore, the lack of an inventive step holds also for claims 2 and 18.

*Claims 3, 12, 19*

See D6, p. 14, 1st par. wherein each of the arrays in the first and second plane can be considered to represent a sensor.

*Claims 4, 14, 21*

Starting from anyone of documents D4 and D6, it would appear that the skilled person would select the transmission coil solely in accordance with circumstances, without the exercise of any inventive skill.

*Claims 5, 13, 20*

See D6, p. 3, l. 20-25.

*Claims 6, 7, 22*

See D7, fig. 2 and p. 7, l. 16-23.

*Claims 8, 15*

The additional features of claim 8 and 15, respectively, would appear to merely represent an obvious alternative to the rf coil array disclosed in D7 which comprises equal length connecting leads connected to the individual coils.

*Claims 9, 16, 23*

See D1, col. 16, l. 5-10.

**Re Item VII.**

**3 Certain defects**

- 3.1** According to Rule 5.1a (ii), documents D1-D7 should have been identified in the description and briefly discussed.
- 3.2** The independent claims should have been drafted in the two-part form in accordance with Rule 6.3(b) PCT, with those features known from the prior art (probably document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 3.3** According to Rule 6.2(b) PCT, reference signs should have been added to the claims.

**Re Item VIII.**

**4 Lack of clarity, conciseness and support by the description (Art. 6 PCT)**

- 4.1** The various definitions of the invention in two independent apparatus claims are such that the set of claims as a whole is not concise. The claims should have been drafted to include only one independent claim per category with dependent claims that cover features that are merely optional.
- 4.2 Claim 1**



- a) The broad term "sensors" covers arrangements not supported by the description, for instance an x-ray detector used to detect contraband. The description would merely appear to support that said sensors are **rf coils** (p. 5, l. 28 - p. 6, l. 13).
- b) It is unclear what is to be understood by the wordings "**specified** NQR frequency" and "**specified** NQR signal" (emphasis added).
- c) It should have been clarified that the rf magnetic field applied to the object is adapted to excite an NQR transition in the object.
- d) The scope of the wording "**adding coherently** the signals detected by the sensors" is unclear. Normally, the term 'coherence' is used to reflect that a **fixed phase relationship** is present among two quantities. However, said fixed phase relationship does not necessarily imply that, when adding said two quantities, they add **constructively**. Rather, said wording covers also the possibility that said quantities add **destructively**. However, this would not appear to be supported by the description (par. bridging pages 8 and 9).

#### 4.3 Claims 2, 3, 11, 12, 18, 19

It is unclear which further limitations compared to claim 1 are to be defined by the wording "each sensor **solely** detects the specified NQR signal".

#### 4.4 Claims 6, 7, 8, 15

The wordings "the electrical path" and "the combination point" lack an antecedent definition.

#### 4.5 Claims 10, 17

- a) The objections raised under items 4.2 a) and b) similarly apply.
- b) Referring to claim 10, the objection raised under item 4.2 d) above similarly applies.

#### 4.6 Description

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

International application No.

**PCT/US2005/003988**

- a) The statement on page 1 according to which a certain document is incorporated by reference should have been deleted.
- b) The statement on p. 13, l. 19 to p. 14, l. 10 results in doubts on the scope of the claims and should have been deleted.